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Mainstreaming nutrition in a school-based feeding programme in northeast Nigeria

Location: *Nigeria*

What we know: Conflict often exacerbates existing weak services, which negatively impact on child nutrition and education, reducing development potential.

What this article adds: In northeast Nigeria, homeless boys are at risk of radicalisation and homeless girls are at risk of increased birth rate and associated infant mortality. In December 2015, the American University of Nigeria (AUN) began a *Feed and Read* programme for marginalised, homeless children excluded from formal education and dependent on religious schooling and begging to survive (a common feature in cities across northeast Nigeria). Two hours of basic literacy and numeracy education and a hot meal are provided every weekday. Initially targeting boys, the programme expanded to include girls. It has had strong community support, with good child academic progress and continues to expand. Nutritional review in 2017 reflected good energy and protein intake per meal but shortfalls in micronutrients; improved dietary diversity is planned. Plans are underway to assess the nutritional impact of the programme; baseline anthropometric, food consumption, health, hygiene and illness data has been collected (April 2017) for follow-up at endline. Future considerations will include use of fortified foods and strategies involving post-harvest processing, storage and school gardens.

Context and crisis

The devastating five-year insurgency led by militant group Boko Haram has exacerbated an already precarious human development situation in northeast Nigeria. The insurgency has caused vast destruction, killing over 20,000 people and displacing 2.1 million in the northeast, 57% of whom are children. While some have fled over borders to neighbouring Chad, Niger and Cameroon, the majority are displaced inside Nigeria, taking shelter in host communities in urban areas rather than in camps. This rapid urban influx has strained resources for basic services such as education and infrastructure, including water and sanitation. The United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) estimates that seven million people need assistance and 450,000 children risk severe acute malnutrition (SAM) across

the three most affected states; Borno, Adamawa and Yobe.

The insurgency exacerbates a dire situation in the region resulting from longstanding neglect and failure to provide basic services and development opportunities. Prior to the outbreak of violence, northeast Nigeria already had some of the lowest development indicators in the country. The World Food Programme (WFP) has noted consistently high rates of global acute malnutrition (GAM) in the affected region; between 10 and 15% over the past five years. Educational outcomes follow a similar pattern: less than 40% of children in northern Nigeria have attended primary school, compared to 90% in the country's south.

The long-term consequences of the lack of educational opportunities for girls and boys are

dire. Uneducated boys risk turning to violent crime or being radicalised. The lack of educational opportunities for girls leads to higher fertility and infant mortality in the region, the rates of which are already among the highest in the world¹.

Target population: Almajiri boys and internally displaced people

In northern Nigeria, boys without formal schooling lack marketable skills and have a low probability of being employed in the modern sector. This also puts downward pressure on the demand for education and creates a vicious circle of underdevelopment. Traditional and religious factors pressure many young boys to leave their homes to receive a Quranic education from mallams, traditional Muslim leaders. These itinerant Quranic scholars (IQS) or Almajiri are typically between the ages of 6 and 25, homeless and a common feature of cities across northern Nigeria. The children are typically from lower-class families, sent by their parents when few other options for education exist. In some families, one or more children may be sent to these schools while others may stay home and attend western-style schools.

The boys receive traditional Islamic instruction in Arabic, focused on increasing knowledge of the Quran. While the *mallams* may provide some basic needs and sustenance for the children, their means are extremely limited. As a result, the children often resort to begging or petty crime to pay their fees to the mallam or get enough to eat. These boys are extremely vulnerable: without a formal education and with limited economic opportunities, they risk resorting to violence or being radicalised or indoctrinated into insurgent groups, such as Boko Haram. The problem is vast: by some government

¹ Based on World Bank fertility rates (births per woman) <http://data.worldbank.org/indicator/SP.DYN.TFRT.IN>



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estimates, there are at least ten million Almajiri children in northern Nigeria.

Compounding the precarious situation of the Almajiri boys, many more children have become vulnerable in the region due to the insurgency. Following an outbreak of violence in 2014 perpetrated by Boko Haram, huge numbers of people were displaced, with many leaving rural areas for the relative security of urban centres such as Yola, the capital of Adamawa state. This influx put a tremendous stress on the already strained educational system. Without educational opportunities, girls often resort to street hawking, begging or other risky behaviours as a result of displacement. They are also vulnerable to early marriage and gender-based violence. Local institutions, church groups and agencies struggle to meet the needs of these children.

Organisation and approach: The American University of Nigeria

The American University of Nigeria (AUN) was founded in Yola in 2004 by Atiku Abubakar, a former vice-president of Nigeria. In addition to running elementary, secondary and university programmes on the American education model, AUN has a mandate to be a 'development university' for Africa and has an office dedicated to development and outreach programmes in the local community, the Atiku Centre for Leadership, Entrepreneurship and Development. In 2015, university staff and administrators recognised the growing number of Almajiri boys begging at the gates of the university and the surrounding neighbourhood. A programme was conceived with the objective of providing one nutritious meal and basic literacy and numeracy training to Almajiri boys from the community. As the programme recorded successes and resources increased, it expanded to include girls, especially those displaced from elsewhere

in the region by the violence. In the nearly 18 months since its inception, the Feed and Read programme has had successes and challenges. In addition to expanding its reach and educational impact, the Atiku Centre at AUN is now committed to improving the nutritional component of the programme.

Project experience and lessons learned to date

Inception and programme design

The AUN *Feed and Read* programme was started in December 2015. Its objective was to provide one healthy meal per day to vulnerable children, in addition to a curriculum of basic literacy and numeracy. Students attend single-sex instruction for two hours on weekday afternoons and receive one hot evening meal after the lessons. This is intended to support healthy growth and development and boost school performance. The educational curriculum covers basic literacy, numeracy and life skills such as handwashing and sanitary behaviours. The curriculum runs for eight months, with the goal of giving students a level of basic literacy and numeracy equivalent to second grade and placing them in the third or fourth grade on completion.

The basic education is intended to enhance students' knowledge of the world and reduce their susceptibility to being influenced by violent radical groups such as Boko Haram. Increased job opportunities through increased marketability would be long-term outcomes resulting from improved nutrition and education. The programme would therefore contribute to development by improving long-term development indicators such as female fertility and child and maternal mortality and by increasing future democratic participation.

Successes, challenges and scaling up

To ensure the success of the programme, AUN has sought the buy-in of the children's parents, guardians, mallams, other community members and state government officials. This was achieved by working through the Adamawa Peace Initiative, an organisation comprised of local religious leaders and AUN. The Almajiri boys' programme saw initial success, with strong community support and many boys willing to participate. After the initial success with boys, AUN received a grant from the Irish government of 18,578 euro to expand access to include girls. Starting with 50 girls, the programme expanded quickly to over 250 girls per day in summer 2016 and private donors were sought to support the growing programme needs. A new cohort began in January of 2017 of approximately 120 boys (aged 11-25) and 135 girls (aged 6-15). The programme hopes to reach over 1,000 students per year, although resource mobilisation for scaling up continues to be a challenge.

In October 2016, 200 boys and 75 girls received certificates of completion at the university's annual Founder's Day celebration, which recognised their success in front of the local community. At the end of the programme for the first intake of students, an end-line assessment

found that they had made a significant improvement based on the Early Grade Reading Assessment (EGRA) and Early Grade Mathematics Assessment (EGMA) exams. On successful completion of the programme, a number of Almajiris enrolled in formal schools.

Finding placement after graduation for all students has been a challenge, however, and some of the boys did return to their traditional Islamic education. AUN is trying to obtain sponsors to adopt students by paying for their fees to attend primary school. Despite completing the *Feed and Read* programme, the lack of prior formal secular education inhibits integration into the school system. There are also discrepancies between students and their academic competency levels: several of the boys are aged 18 years or older, which means they are too old for primary school. In these cases, the goal is to pair them with apprenticeships, entrepreneurial work or trades. For female graduates, it is hoped that the education exposure will break cultural taboos and that other parents will be more willing to educate their daughters.

Mainstreaming nutrition in the Feed and Read programme

The provision of healthy meals to students is a central component of the programme. A filling, nutritious meal increases students' health and wellbeing and allows them to perform better in lessons. It also increases demand for participation in the programme from children who may not otherwise receive a daily proper meal or who resort to begging. Programme staff have anecdotally observed that students' apparent health and attentiveness improved after participation in the programme; informal feedback from children and their caretakers confirmed the same. However, in January 2017, an Atiku Centre internal evaluation recognised that a more formal approach to tracking nutritional progress was necessary. The systematic collection and tracking of data would allow the programme to better meet the nutritional needs of students and demonstrate effectiveness in order to mobilise future sources of funding.

It was determined that the mainstreaming of nutrition in the programme would take two approaches: measuring and improving the nutritional value of food served and tracking student health and growth. Tracking would occur through anthropometry and qualitative questionnaires covering food consumption, hunger, coping strategies and health outcomes. To date, the nutritional value of the rations has been analysed and baseline anthropometry and questionnaires have been administered.

Nutritional analysis of typical meal served

At programme inception, community representatives identified women from the local community to cook meals of their choice; those who could handle changing programme needs were employed long-term. There is one cook each for the boys' and girls' programmes, which take place separately for cultural gender considerations.

Table 1 Nutrient values of an average portion of the typical Feed and Read meal served

	White Rice	Meat (Beef)	Tomato	Onion	Oil	Pepper	Mixed ground spices	TOTAL
Average Weight (g)	396.27	8.66	34.65	10.4	15.59	0.52	0.11	466.2
Energy (kcal)	531	27.2	9.7	4.68	140.35	0.2	0.37	713.5
Protein (g)	10.44	2.65	0.45	0.15	0	0.01	0.01	13.7
Fat (g)	0.91	1.85	0.08	0.01	15.59	0	0.01	18.46
Ca (mg)	19.81	0.95	5.2	3.01	0	0.07	0.71	29.76
Fe (mg)	2.13	0.42	0.21	0.03	0	0	0.01	2.8
Mg (mg)	53.34	2.17	4.5	0.73	0	0.06	0.14	60.94
Zn (mg)	1.68	0.49	0.26	0.02	0	0	0	2.47
Vit A-RAE (mcg)	0	3.29	66.62	0.02	0	3.28	0.09	73.3
Vit D (mcg)	0	0.07	0	0	0	0	0	0.07
Vit E (mg)	0.17	0.04	0.39	0.01	6.12	0.01	0	6.72
Thiamine (mg)	0.05	0	0.02	0	0	0	0	0.08
Riboflavin (mg)	0.05	0.03	0.01	0	0	0	0	0.1
Niacin (mg)	1.49	0.41	0.17	0.02	0	0	0	2.09
Vit B6 (mg)	0.15	0.02	0.03	0.01	0	0	0	0.21
Folate (mcg)	21.34	0.52	5.1	1.04	0	0.14	0.04	28.18
Vit B12 (mcg)	0	0.1	0	0	0	0	0	0.1
Vit C (mg)	0	0	8.03	0.44	0	0.58	0.04	9.09

In 2017, a deliberate attempt was made to standardise the meals and quantity of food served in programmes. Cooks were instructed to include protein in the form of meat or fish daily with the meal. In addition, efforts were made to standardise the serving size and to increase the size to meet the requirements of an 18-year-old. A nutritional analysis of a typical meal (white rice served with beef stew) was performed to examine the progress in reaching that goal. Usually composed of tomatoes, onions, peppers, oil and spices, there was some variation; cooks indicated they also may prepare jollof (spiced) rice, other vegetables such as spinach, spaghetti, white beans (cowpea), yam and occasionally yogurt.

Time, resources, and other practicalities (such as the sensitivity of cooks to staff visiting their kitchens) precluded the measurement of ingredients actually used by cooks during preparation. Instead, the recipe and proportions for ingredients in this 'typical meal' were determined by consulting recipes provided by popular national food brands. Programme staff then visited the *Feed and Read* sessions to measure the weight of actual meals served using a digital scale, correcting for the weight of the empty plate. The average weight of the meal was found to be 466.2 grams. Measurements were also made of the proportion of rice and stew; rice was found to constitute 85% of the meal by weight.

This analysis indicates the kind of meal consumed by students and provided a satisfactory starting point to make recommendations for programme improvement. After determining the relative weights of ingredients in the typical meal of average weight, nutrient values for each ingredient were determined using the *FAO West African Food Composition Table* (Stadlmayr, 2012) and accounting for nutrient losses during

cooking. These values were summed across ingredients to determine the total levels of each nutrient in the average serving. These nutrient levels are displayed in Table 1.

The final step involved determining the recommended nutrient intakes (RNI) for age and sex groups corresponding to students participating in the programme. RNI was selected as it represents the intake that meets the nutrient requirements of almost all (97.5%) of apparently healthy individuals in the population. Three physiological groups were examined: children aged 7-9 years, females aged 10-18 years and males aged 10-18 years. RNI values were taken from *Vitamin and Mineral Requirements in Human Health* (WHO and FAO, 2004). The nutrient levels in the typical meal were divided by the RNI for each group to determine the proportion of that group's recommended intake that would be met by a typical meal provided by the *Feed and Read* programme. These results are displayed in Table 2.

Discussion of the nutritional analysis of typical meal

The nutritional analysis of the typical meal revealed several important findings. A meal of average size, prepared according to the assumed recipe and proportions, provides approximately 714 calories, 14 grams of protein and 18 grams of fat (Table 1). Clearly this represents a very important source of nutrition for vulnerable Almajiri boys and displaced children of all age groups who would not otherwise eat such a daily meal.

It is understood that the *Feed and Read* programme provides the largest and most nutritious meal of the day for most of the students; therefore the ration would ideally meet 25%-33% of the daily micronutrient requirements for all students up to age 18. As shown in Table 2, however,

Table 2 Percentage of RNI met by the typical Feed and Read meal

	Children 7-9 years	Females 10-18 years	Males 10-18 years
Ca (mg)	4.25%	2.29%	2.29%
Fe (mg)	31.44%	8.56%	14.88%
Mg (mg)	60.94%	27.70%	26.50%
Zn (mg)	22.01%	17.12%	14.42%
Vit A-RAE (mcg)	14.66%	12.22%	12.22%
Vit D (mcg)	1.32%	1.32%	1.32%
Vit E (mg)	96.07%	89.67%	67.25%
Thiamine(mg)	8.92%	7.30%	6.69%
Riboflavin (mg)	10.70%	9.63%	7.41%
Niacin (mg)	17.40%	13.05%	13.05%
Vit B6 (mg)	20.69%	17.24%	15.91%
Folate (mcg)	9.39%	7.04%	7.04%
Vit B12 (mcg)	5.44%	4.08%	4.08%
Vit C (mg)	25.99%	22.74%	22.74%

Notes on Table 2: The analysis assumes a low bioavailability of zinc and a 10% availability of iron, consistent with the diets of poor populations heavily dependent on cereal staple foods, which contain inhibitors of mineral absorption. As the iron requirements for adolescents can vary greatly, especially between pre- and post-menarche females, the higher requirement was selected.

almost all micronutrients fall well below this target. As expected, the gap between the ration and the requirements is greater for older adolescents and males, who have higher nutrient requirements.

The analysis found that the nutrients meeting the highest proportion of recommended intake were vitamin E, magnesium and vitamin C. Those farthest from meeting the requirements were vitamin D, calcium, vitamin B12, thiamine, folate and riboflavin. Other nutrients of vital public health importance, such as iron, zinc, and vitamin A, also fell short of meeting the goal of 25% of daily recommended intake. This is primarily due to the high relative proportion of white rice, constituting 85% by weight. While rice provides an important and relatively low-cost source of energy, it has low levels of many other essential nutrients. Excessive refining and polishing of cereal crops such as white rice also removes important B vitamins such as thiamine and riboflavin.

Recommendations and moving forward

Improving the nutritional value of the meal

The first recommendation is to improve the proportion of beef stew to rice in the meal. While this will increase programme costs, it is attainable in the short run because it does not require any education or behaviour change on the part of the cooks. It could be implemented and monitored by using standardised utensils to ensure that students receive enough stew relative to rice and that all students receive the same portion.

The second recommendation is to improve the dietary diversity of the meals by incorporating more nutrient-dense vegetables and plant foods. An immediately actionable recommendation

would be to add several readily available and low-cost plant foods. These include carrots (vitamin A), cowpea/black-eyed pea (folate and iron) and spinach (vitamins A and C). Tomato is an important source of vitamin C and its quantity should be increased, or other sources of vitamin C such as oranges should be included.

In the long-run other animal-source foods such as chicken, liver, milk, yogurt and eggs can be incorporated into meals. Although relatively more expensive than plant foods, animal foods are important sources of iron, zinc, vitamin B12, vitamin A and other nutrients. Some other vegetable foods offer a more affordable source of vitamin A, especially carrots, dark vegetables such as spinach, and orange non-citrus foods such as mango and papaya. Pulses, legumes and nuts such as cowpea and groundnuts should be considered as they provide folate. These plant foods also supply phytonutrients and antioxidants which are important for health.

Challenges to the promotion of dietary diversification include the possibility that some of these foods, especially animal-source foods, may be expensive and others may be difficult to find or only available seasonally. There may also be challenges to incorporating them into familiar local meals. Therefore, local food experts should advise on how to develop nutritious and culturally appropriate recipes in consultation with the programme cooks. The programme could also educate cooks on improved preparation, processing and storage methods to maximise nutrient retention.

Tracking nutritional gains through anthropometry and survey data

The second approach to mainstreaming nutrition in the Feed and Read programme is to track student growth and health through anthropometry and qualitative surveys. Surveys were designed and administered to all students in the current intake of the programme in April 2017. The anthropometric data collected includes height, weight and mid-upper arm circumference (MUAC). In the survey component, students were asked to answer a brief questionnaire on topics including food-consumption recall, perceptions of hunger, hunger and coping practices, sickness and basic hygiene.

The next steps will be to analyse the data, which will provide a baseline for subsequent comparison. The same measurements will be taken at end-line to assess any growth and health improvements that students made during participation in the programme. The most important indicator for tracking growth will be Body Mass Index (BMI)-for-age (de Onis et al, 2007). Individual indicators will be compared against age- and gender-appropriate reference groups to classify participants according to severe thinness, thinness, obesity and overweight.

During the most recent intake of students, one major challenge was getting the baseline data collection done at the start of the programme. As a result of logistical challenges such as staff training, scheduling and obtaining scales, the data collection was delayed. Fortunately, the

programme has now obtained the necessary anthropometry equipment and will be able to perform timely data collection for future intakes based on lessons learned.

Tracking student health in this manner poses several challenges, most importantly attributing any gains made to participation in the programme rather than to external factors. Crucial periods of growth will have already taken place before participants joined the programme, and the eight-month period of participation may not be long enough to see any measurable anthropometric change, even if health improves. There may also be unmeasurable outside factors that negatively affect growth. For example, if students are chronically exposed to intestinal infections from unsanitary environments, they may be unable to utilise the nutrients provided during the programme.

A potential avenue for future research would be to set-up an experimental or quasi-experimental design using a control group of students. During each intake, there are students who are unable to participate due to capacity limitations. These students could be measured as the control group against which to compare the intervention group. These waitlisted students would then be given preference for admission in the next round of intakes, during which their continued progress would be tracked.

Other future avenues to improve nutrition

Several other areas of programmatic improvement remain to be explored. The use of fortified foods, especially oil, rice and flours, as well as micronutrient supplementation, should be considered. Partnerships should be made with local food processors for fortified foods and with health agencies and health-focused, non-governmental organisations (NGOs) to procure supplements. The partnerships with health agencies can also be leveraged to provide other health services, such as deworming and immunisations, which will improve school performance and overall health.

The programme may also consider other dietary diversification and modification strategies, such as post-harvest processing, storage and school gardens. In diets heavily reliant on cereal staples, processing methods such as soaking, germinating and fermenting can improve the nutritive value of essential minerals such as zinc and iron. Other food storage techniques that retain nutrition value, such as drying and canning, could be explored with local partners. School gardens could provide an effective means to teach children about nutrition, get them involved in a hands-on process and increase the availability of micronutrient-rich vegetables.

Conclusion

The AUN Feed and Read programme has made important strides in addressing the academic and nutritional needs of vulnerable children in the region. The experience to date has been successful on several fronts. The programme has received strong community support and



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has seen growing demand from children and families. Literacy and numeracy tests have demonstrated academic progress, with some graduates able to continue their education with placement in formal schooling.

Renewed priority has been given to improving the school meals and tracking nutritional growth. An analysis of meal composition suggests that the proportion and quantity of meat, vegetables and legumes relative to rice in the meals should be increased. Specifically, carrots, beans, spinach and tomatoes can address the gaps identified in micronutrients. The recently implemented efforts to track student anthropometry and health will both provide evidence of success and help identify additional areas for improvement.

Experience and analysis shows that there are still many channels through which the AUN can improve the nutritional component of the Feed and Read programme for vulnerable youth and street children. Each of these channels should be considered, explored and evaluated in terms of efficacy and cost-effectiveness. Rigorous tracking is an essential part of this process. This article summarises the first steps in such an approach, which can be scaled up and replicated to address nutritional priorities in a variety of school-based feeding programmes.

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